Bernanke's 2010 US Economic Recovery: Evidence From A Minimal Spanning Tree Study

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Acknowledgments

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'Green Shoots' of US Economy

Recession officially ended in June 2009

Bernanke sees 'green shoots' of US re June 2009

(AFP) - Mar 15, 2009

WASHINGTON (AFP) — In his first television interview, Federal Reserve predicted that America's worst recession in decades will likely end this gathers steam next year.

The "green shoots" of economic revival are already evident, Bernanke to Minutes" in the interview broadcast late Sunday, which the network sail sitting Fed chairman in 20 years.

His assessment chimed with a new tone of cautious optimism from Pre administration as top economic aides took to the airwaves earlier Sund

"It is an economic war. We haven't won yet. We have staged a wonder Romer, chairwoman of the White House Council of Economic Advisers Press."

Echoed by Lawrence Summers, director of Obama's National Economi proposal from Treasury Secretary Timothy Geithner to clean out US ba "come out very soon."

Predicting that no more big banks will fail, Bernanke also called on Wa politicians to show the will needed for recovery, arguing the world came moltdown last September before government intervention.



By Chris Isidore, senior writer September 20, 2010: 4:00 PM ET

NEW YORK (CNNMoney.com) -- The Great Recession ended in June 2009, according to the body charged with dating when economic downturns begin and end.

Time Series Segmentation

Non-stationary time series

- $-\mathbf{x} = (x_1, x_2, ..., x_N)$
- Assume consists of M stationary segments
- Data points in segment m drawn from $N(\mu_m, \sigma_m^2)$

Recursive segmentation

- One time series → two segments
- Each segment → two subsegments
- Iterate + optimize
- Terminate

Jensen-Shannon Divergence

• Single-segment likelihood for $(x_1, x_2, ..., x_N)$

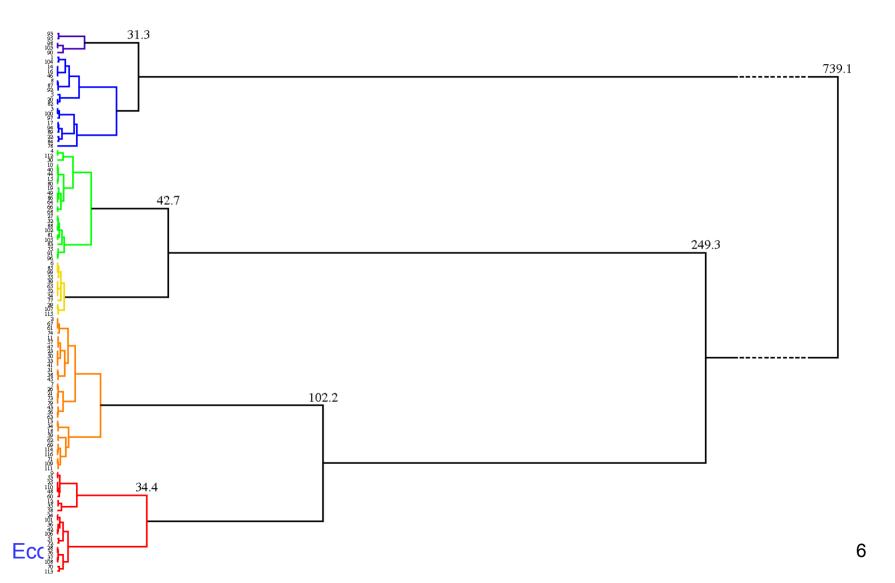
$$L_1 = \prod_{i=1}^{N} \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{(x_i - \mu)^2}{2\sigma^2}\right]$$

• Two-segment likelihood for $(x_1, ..., x_t, x_{t+1}, ..., x_N)$

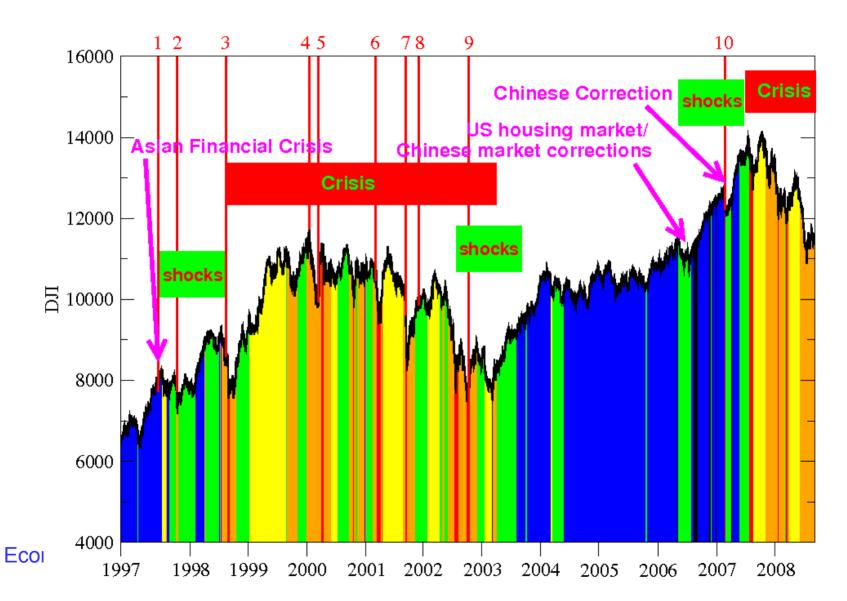
$$L_{2}(t) = \prod_{i=1}^{t} \frac{1}{\sqrt{2\pi\sigma_{L}^{2}}} \exp\left[-\frac{(x_{i} - \mu_{L})^{2}}{2\sigma_{L}^{2}}\right] \prod_{i=t+1}^{N} \frac{1}{\sqrt{2\pi\sigma_{R}^{2}}} \exp\left[-\frac{(x_{i} - \mu_{R})^{2}}{2\sigma_{R}^{2}}\right]$$

- ML estimates $\hat{\mu}, \hat{\mu}_L, \hat{\mu}_R, \hat{\sigma}^2, \hat{\sigma}_L^2, \hat{\sigma}_R^2$
- Jensen-Shannon divergence $\Delta(t) = \ln \frac{L_2(t)}{L_1} \ge 0$

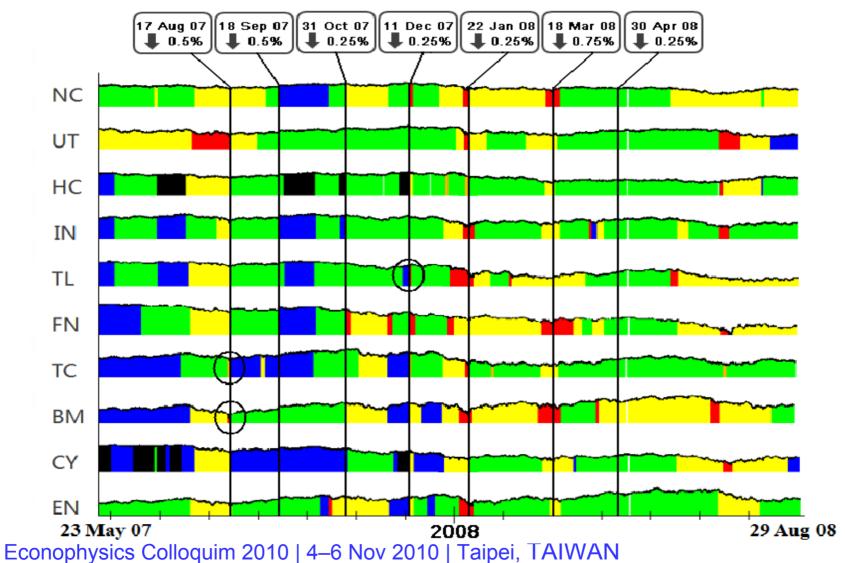
Segmentation + Clustering



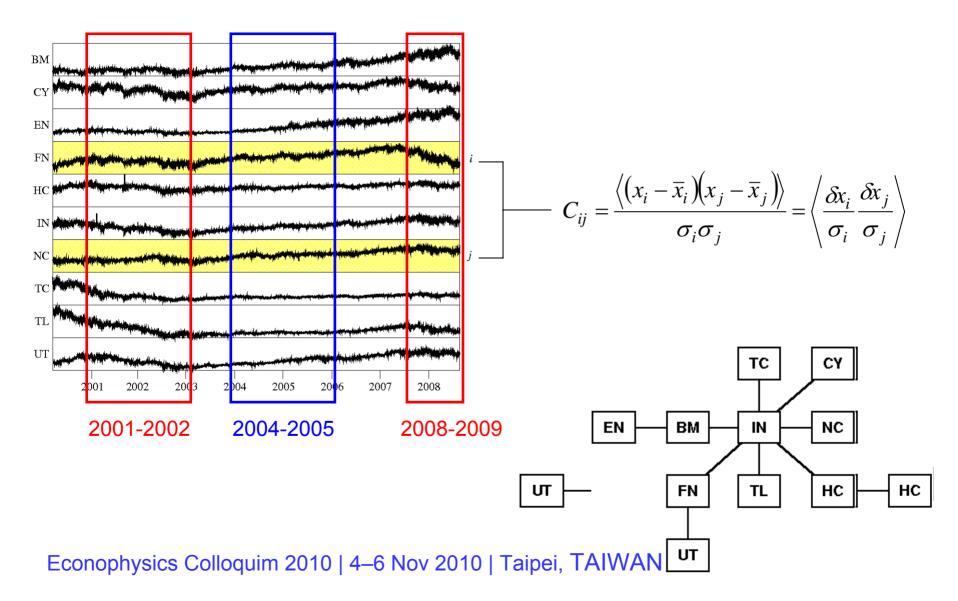
Dow Jones Industrial Average



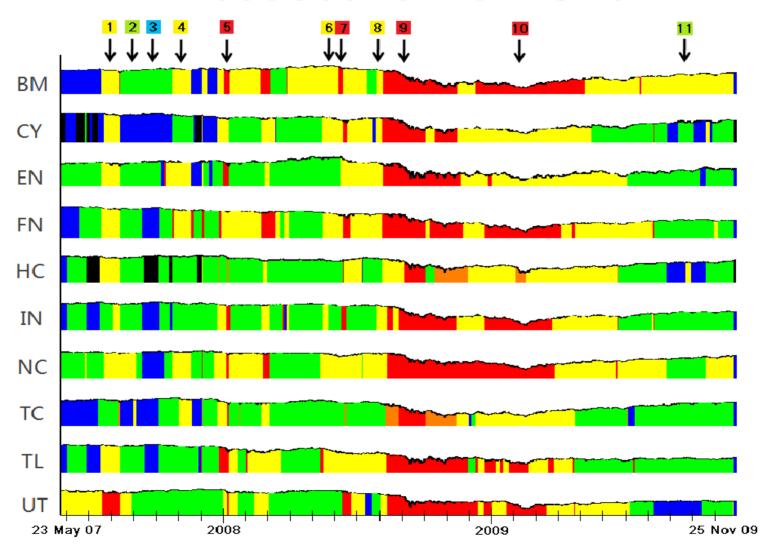
Dow Jones US Economic Sectors



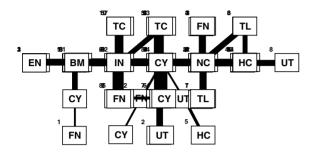
Macroeconomic MSTs

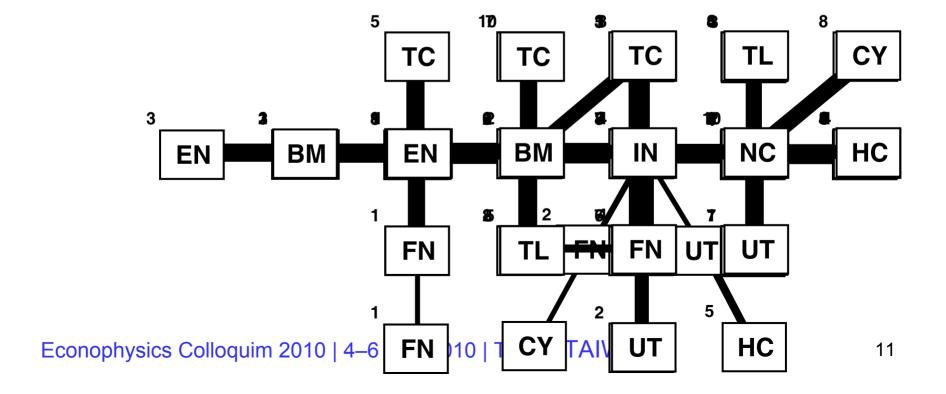


Mesoeconomic MSTs

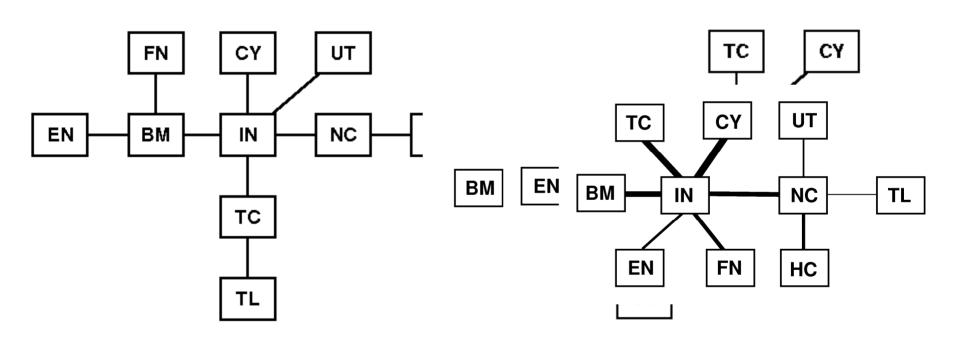


Mesoeconomic MSTs





Early Signs of Economic Recovery?



Sep 2009

Conclusions

- Previous study on US economy
 - 1.5-year recovery from previous crisis
 - 2-month descent into present crisis
 - Strong driving from Fed rate cuts
- Present study on US economy
 - Robust star-like MST within growth phase
 - Robust chain-like MST within crisis phase
- Early indication of economic recovery
 - Nearly star-like MST in Sep 2009
 - Robust star-like MSTs throughout Greek Debt Crisis

Thank You!

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